EXHIBIT 4

Dictionary of Computer and Internet Terms

Sixth Edition

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Now the expression

```
clist[7].name
```

will refer to the name for customer 7,

```
clist[8].balance
```

will refer to the balance for customer 8, and so on.

In object-oriented languages, the same concept is used in a more general fashion: an OBJECT can include methods as well as data items.

recovering erased files retrieval of deleted files whose space has not yet been overwritten by other data.

When you erase a file on a computer disk, the space that the file occupied is marked as free, but it is not actually overwritten until the space is needed for something else. If you erase a file accidentally, you can often get it back by using programs such as Norton Utilities or analogous programs on other machines. As soon as you realize you want to recover a file, do everything you can to stop other programs from writing on the same disk so that nothing else will be written in the space that the file occupied.

On the Macintosh and in Windows 95 and 98, deleted files usually go into a trash can or recycling bin from which they can be retrieved. The disk space is not actually freed until the user empties the trash. Until then, the files can be restored to their original locations.

recursion the calling of a procedure by itself, creating a new copy of the procedure.

To allow recursion, a programming language must allow for local variables (thus, recursion is not easy to accomplish in most versions of BASIC). Each time the procedure is called, it needs to keep track of values for the variables that may be different from the values they had the last time the procedure was called. Therefore, a recursive procedure that calls itself many times can consume a lot of memory.

Recursion is the natural way to solve problems that contain smaller problems of the same kind. Examples include drawing some kinds of fractals (*see* FRACTAL); parsing structures that can have similar structures inside them (*see* PARSING); sorting (*see* QUICKSORT); and calculating the determinant of a matrix by breaking it up into smaller matrices.

A recursive procedure can be used to calculate the factorial of an integer. (*See* FACTORIAL.) Fig. 212 shows a Pascal program that does so.

The recursion occurs when the function `fact` calls itself. Note that the `ELSE` clause is crucial. That clause gives a nonrecursive definition for the factorial of zero. If it were not there, the program would end up in an endless loop as the function `fact` kept calling itself until the computer ran out of memory. Any time recursion is used, it is

```
PROGRAM factorial(INPUT,OUTPUT);
VAR x:INTEGER;

  FUNCTION fact(x: INTEGER) : INTEGER;
    VAR t:INTEGER;
    BEGIN
      writeln('Now looking for factorial of',x);
      IF x > 0 THEN z := x * fact(x-1) ELSE z := 1;
      { Here is the recursion^^^^^^^^^}
     writeln('The factorial of ',x,'is',z);
     fact :=z
   END; {end of procedure fact}

BEGIN  { main program begins here }
  readln(x);
  writeln(fact(x))
END.
```

FIGURE 212. RECURSION IN PASCAL

necessary to make sure that there is some condition that will cause the recursion to halt.

Following is an example of the output from this program when the number 4 is given as the input. In practice, you would want to remove the two `writeln` statements from the function, but they are included here to make it possible to see the order of execution.

```
Now looking for factorial of 4
Now looking for factorial of 3
Now looking for factorial of 2
Now looking for factorial of 1
Now looking for factorial of 0
The factorial of 0 is 1
The factorial of 1 is 1
The factorial of 2 is 2
The factorial of 3 is 6
The factorial of 4 is 24
24
```

Any iterative (repetitive) program can be expressed recursively, and recursion is the normal way of expressing repetition in Prolog and Lisp.

Recycle Bin the place in Windows 95 and 98 where deleted files are stored, corresponding to the TRASH on the Macintosh. You can put a file in the Recycle Bin by dragging it there or by choosing "delete" in Explorer and similar applications. However, software can also delete files directly and irretrievably.

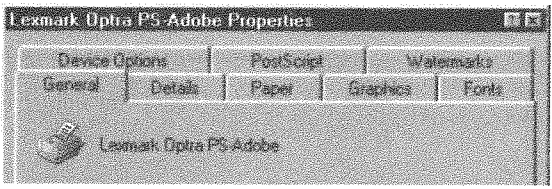

FIGURE 250. TABS IN DIALOG BOX

2. a visual indication of multiple pages in a dialog box. Click on the appropriately-labeled tab to get to the desired page.

table an arrangement of data in a database where each row defines a relationship between the items in that row. *See* RELATIONAL DATABASE.

table, HTML special HTML tags and commands for displaying tabular material. A web page can include various items arranged in a table by using the `TABLE` tag in HTML. Here is an example:

```
<HTML><HEAD><TITLE>Table Example</TITLE></HEAD>
<BODY>
<H2> HTML Table Example</H2>
<TABLE BORDER>
<TR><TD>President</TD><TD>Years in Office</TD>
     <TD>Home State</TD></TR>
<TR><TD>George Washington</TD><TD>1789-1797</TD>
     <TD>Virginia</TD></TR>
<TR><TD>John Adams</TD><TD>1797-1801</TD>
     <TD>Massachusetts</TD></TR>
<TR><TD>Thomas Jefferson</TD><TD>1801-1809</TD>
     <TD>Virginia</TD></TR>
</TABLE>
</BODY></HTML>
```

The `BORDER` attribute automatically sets up a border for the table; the border can be set wider by specifying its width in pixels (`BORDER=3`). If no border is desired, simply delete the `BORDER` attribute.

Each row of the table is enclosed between the `<TR>` and `</TR>` tags, and each data item in the table is enclosed between `<TD>` and `</TD>` tags. The web browser will automatically line up the items correctly; it doesn't matter where the line breaks in the HTML code occur. Figure 251 shows how this table is displayed.

error-handling routine supplied by the programmer. If no error trapping were provided, the program would simply end with an error message that might puzzle the user. In BASIC, trapping is activated by statements such as **ON ERROR**. For a Java example, *see* TRY.

2. the technique of aiding the REGISTRATION of color plates in a printing job by creating slight areas of overlap where two colors meet. The area of the overlap is called TRAP.

Some software is capable of creating trap automatically (*see* PREPRESS; DESKTOP PUBLISHING). At other times, the designer will have to intentionally overlap design elements to ensure full coverage, even with a sight misregistration.

Trapping is only necessary when preparing CAMERA-READY COPY for a printing press; there are no registration problems when printing directly from your computer to a color printer.

Trash the place where deleted files are stored on the Macintosh, corresponding to the RECYCLE BIN under Windows 95 and 98. The space occupied by the files does not become available until you empty the Trash. Until then, you can get the files back if you need them.

Traveling Salesman Problem the mathematical problem of finding the shortest route that connects *n* points, given the distances between the points. As far as is known, this problem can be solved only by exhaustive search, which can take a gigantic number of steps. *See* LIMITS OF COMPUTER POWER.

tree

1. a data structure similar to a linked list, except that each element carries with it the addresses of two or more other elements, rather than just one. *See* LINKED LIST.

Trees are a very efficient way of storing items that must be searched for and retrieved quickly. Suppose, for example, that you want to store the following names in a computer:

Jones	Voss
Steinfeld	Marino
Alexander	Zhang
Bateman	Rodriguez

The names can be arranged into a tree by using the following two-step procedure:

1. Use the first name on the list as the root of the tree.

2. To find where to put each subsequent name, start at the root of the tree. If the name you are dealing with precedes the root name alphabetically, follow the left pointer; otherwise follow the right pointer. Proceed in this way until you come to an empty pointer; attach the new name to it.

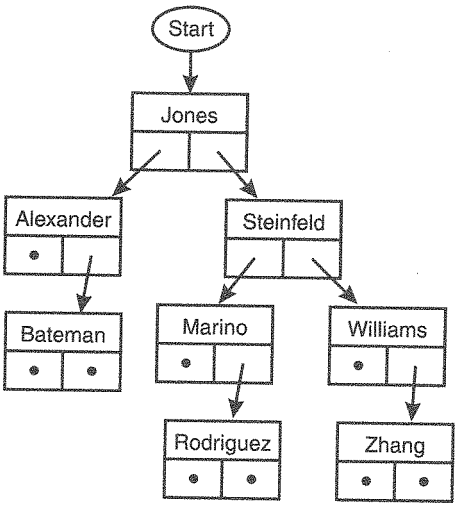

FIGURE 269. TREE (FOR BINARY SEARCH)

The result is the tree shown in Figure 269. Step 2 in the procedure above can be used to locate names already in the tree in a minimum of steps (in this case, no more than four steps even though there are eight names in the list). The algorithm that results is not quite as good as a binary search, but it is much better than having to work through the whole list. Furthermore, as with linked lists, new nodes can be added at any time without requiring that existing nodes be moved.

2. a branching structure in which information is stored: for example, a system of directories and subdirectories (*see* DIRECTORY) or a branching diagram of a web site.

trigonometric functions the mathematical functions that relate an angle to the lengths of the sides of a right triangle (Figure 270), defined thus:

$$\sin\theta = \frac{\text{length of opposite side}}{\text{length of hypotenuse}}$$

$$\cos\theta = \frac{\text{length of adjacent side}}{\text{length of hypotenuse}}$$

$$\tan\theta = \frac{\text{length of opposite side}}{\text{length of adjacent side}} = \frac{\sin\theta}{\cos\theta}$$

If θ is small, $\sin\theta \approx \tan\theta \approx \theta$ (measured in radians). *See also* ARC SINE; ARC COSINE; ARC TANGENT; ATN; SIN; COS; TAN.